

Comparison of Soil Quality Using Different Manure Ratios Affecting

Butterfly Pea Plant Growth and Development

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Abstract

This study aimed to compare soil quality and the growth of butterfly pea plants under different manure treatments, including cow manure, chicken manure, and a mixture of cow and chicken manure. The objectives were to examine changes in soil quality and to compare the growth of butterfly pea plants cultivated with each type of manure. The experiment was conducted by measuring soil moisture, soil pH, and macronutrient levels, including nitrogen, phosphorus, and potassium (NPK), which are important factors affecting plant growth. The results showed that different manure treatments had various effects on soil quality and plant growth. Butterfly pea plants grown in soil amended with mixed manure and chicken manure exhibited better and more consistent height growth compared to those grown with cow manure alone. Soil quality analysis indicated that manure application helped adjust soil pH to a suitable range (approximately 6-7), which is optimal for butterfly pea growth. In addition, the levels of essential nutrients such as nitrogen, phosphorus, and potassium increased, supporting chlorophyll production and stem development. Environmental factors such as soil moisture and light intensity also influenced plant growth. Proper moisture control enhanced nutrient absorption from manure, contributing to healthier plant development. Overall, the study demonstrates that appropriate manure types and ratios can improve soil quality and promote the growth of butterfly pea plants.

Keywords: butterfly pea plant, soil quality, manure ratio, plant growth

Research Questions

Asking Questions

1. The quality of the soil at the planting area of the pea tree with the addition of cow manure, chicken manure, cow manure mixed with chicken manure. Is there a difference?
2. Growth of pea trees with the addition of cow manure, chicken manure, cow dung mixed with chicken manure. Is there a difference?

Introduction

Content Knowledge

Chapter 1: Introduction

1.1 Background and Significance

Butterfly Pea (*Clitoria ternatea* L.) has gained significant popularity as a multipurpose medicinal and ornamental plant. Rich in Anthocyanin, it offers antioxidant properties used in food, beverages, and cosmetics. For optimal growth, the quality of soil and nutrient availability is paramount. While chemical fertilizers provide quick results, long-term use deteriorates soil structure and kills beneficial microorganisms.

Organic fertilizers, specifically animal manure, offer a sustainable alternative. Manure improves soil porosity, moisture retention, and provides essential N-P-K nutrients. However, different types of manure possess distinct characteristics. Cow manure is rich in organic matter, improving soil texture over time, though it releases nutrients slowly. In contrast, chicken manure is highly concentrated in nitrogen and phosphorus, promoting rapid growth but carrying a risk of high salinity. This study explores the potential of mixing cow and chicken manure to combine the structural benefits of the former with the nutrient density of the latter.

By comparing soil mixed with cow manure, chicken manure, and a hybrid blend, this project seeks to identify the most effective organic medium for Butterfly Pea cultivation. This knowledge will assist farmers in reducing costs and promoting eco-friendly agriculture.

1.2 Objectives

1. To compare the growth of Butterfly Pea in soil mixed with different types of manure.
2. To analyze physical changes such as plant height and leaf count based on manure type.

1.3 Hypothesis

The hybrid blend (cow manure mixed with chicken manure) will yield the best growth results due to a balanced combination of improved soil structure and high nutrient concentration.

1.4 Variables

- Independent Variable: Type of manure (Cow, Chicken, and Hybrid Blend).
- Dependent Variable: Growth metrics (Plant height, number of leaves).
- Controlled Variables: Soil type, water volume, sunlight exposure, and pot size.

1.5 Expected Benefits

1. Identification of the optimal manure for Butterfly Pea.
2. Promoting the use of local organic waste over chemical alternatives.

Research Methods

Planning INvestions

Describes the planning process

Research Hypotheses

1. Soil quality differs when cow manure, chicken manure, and mixed manure are applied.
2. The growth of butterfly pea plants differs with different types of manure.

Materials and Equipment

Beakers, glass stirring rods, glass funnels, filter paper, Petri dishes, distilled water, universal indicator paper, NPK meter, and tape measure.

Research Methods

Part 1: Soil Quality Study

Soil pH was measured by mixing soil with distilled water, filtering the solution, and testing with universal indicator paper (three trials).

Soil nutrient content (N, P, K) was measured using an NPK meter inserted into the soil.

Part 2: Soil Moisture Study

Soil moisture in each pot was measured using an automatic soil moisture meter.

Part 3: Plant Growth Study

Butterfly pea seedlings with similar size were planted in equal-sized pots with different manure treatments.

All plants were grown under similar conditions, watered twice daily, and no additional fertilizer was applied.

Plant height was measured weekly using a tape measure throughout the experiment.



Carrying Out Investigations

Describes what happened

area	Geographic coordinates	
	Latitude (N)	Longitude (E)
Butterfly pea plant pot	7.50451	99.62862

GLOBE Badges

Be a Collaborator

The butterfly pea group worked as a team, collaborating on research, gathering information, and measuring various parameters.

Be a Data Scientist

The group using butterfly pea plants has presented the various values in a graph for easy understanding.

Make an Impact

The butterfly pea group used local organic fertilizers to cultivate the butterfly pea plants, maximizing the benefits of using organic fertilizers.

Results

Analyzing Data

A study comparing the quality of soil with different ratios of manure that affects the growth of anchan trees has been studied

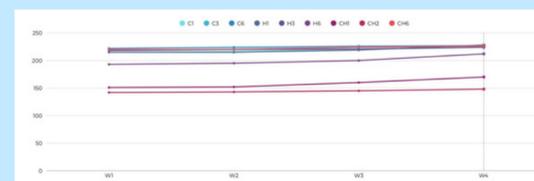
as follows:

C1=1st sack of cow manure, C3=3rd sack of cow manure, C6=6th sack of cow manure.

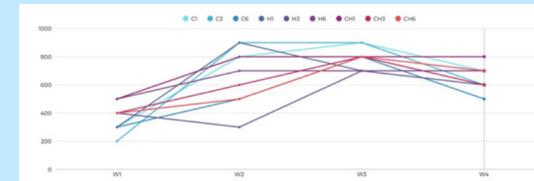
H1= 1st sack of chicken droppings, H3 = 3rd bag of chicken droppings, H6= 6th bag of chicken droppings

CH1= Cow manure mixed with chicken manure sack 1 , CH3 = cow manure mixed with chicken manure sack 3 , CH6 = cow manure mixed with chicken manure sack 6

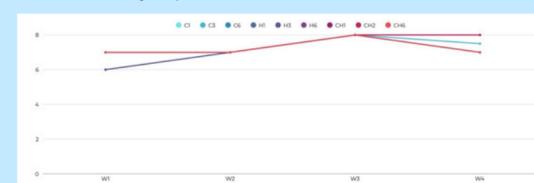
Picture 1 Growth Line Chart



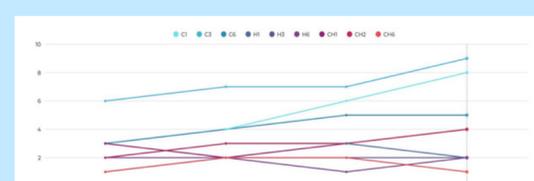
Picture 2 Humidity Line Chart



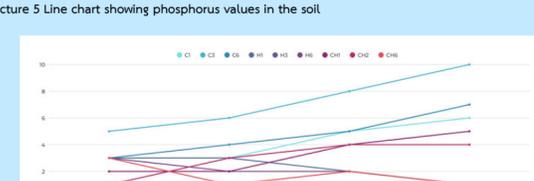
Picture 3 Line chart showing acidity-base value



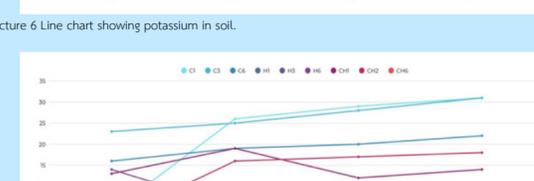
Picture 4 Line chart showing the nitrogen value in the soil



Picture 5 Line chart showing phosphorus values in the soil



Picture 6 Line chart showing potassium in soil



Discussion

Interpreting Data

Efficiency of chicken manure and mixed manure: The reason why chicken manure has a positive effect on growth maybe because chicken manure contains more nutrients, especially nitrogen and phosphorus, than cow manure. When mixed (mixed manure), the soil has a richer and more complete range of nutrients.

pH adjustment: From the pH graph (Figure 4), it can be seen that in the last weeks, the pH value has become more stable, reflecting that the microorganisms in the manure help to decompose organic matter and balance the soil, which directly affects the solubility of nutrients for plants to use.

Relationship of humidity and light: despite the control of external factors, from the humidity (photo 2) and light (photo 3) graphs there is a fluctuation. It shows that the anchan has a response to the weather on a daily basis. However, the continued increase in growth suggests that "manure soil nutrients" are the main factor that supports growth despite climate change.

Conclusions

Drawing Conclusions & Next Steps

According to a comparative experiment using 3 types of manure, cow manure (C), chicken manure (H), and mixed manure (CH) in a given ratio, it was found:

Growth aspects: Each type of manure affects the height and growth of the pea plant differently. According to the growth graph (Figure 1), the group using mixed manure (CH) and chicken manure (H) tended to increase height better and more stable than cow manure alone in some of the experiments.

Soil quality (pH and NPK): The use of manure helps to adjust the acidity-alkalinity (pH) of the soil to the optimal range (around 6-7, which is a neutral to mildly acidic level) and helps to increase macronutrients such as nitrogen (N), phosphorus (P), and potassium (K), which are necessary for chlorophyll formation and stem expansion.

Environmental factors: Soil moisture and light intensity also have an impact by controlled humidity that allows for efficient absorption of nutrients from manure.

Bibliography

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